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AVENAL ENERGY AFC

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6.16 PUBLIC HEALTH

This section describes the existing public health environment, maximum potential impacts from the Project, and design features that keep these impacts below public health-related thresholds of significance. Aspects of the Project that benefit public health include the use of optimized stack height to reduce ground-level concentrations of emissions and the sole use of clean-burning natural gas. These design and operating aspects will keep potential public health impacts below a level of significance. As discussed in Section 6.15 - Hazardous Materials Handling, multiple design features will be implemented to assure that potential public health impacts of a hypothetical accidental release of aqueous ammonia also will be kept below a level of public health-related significance.

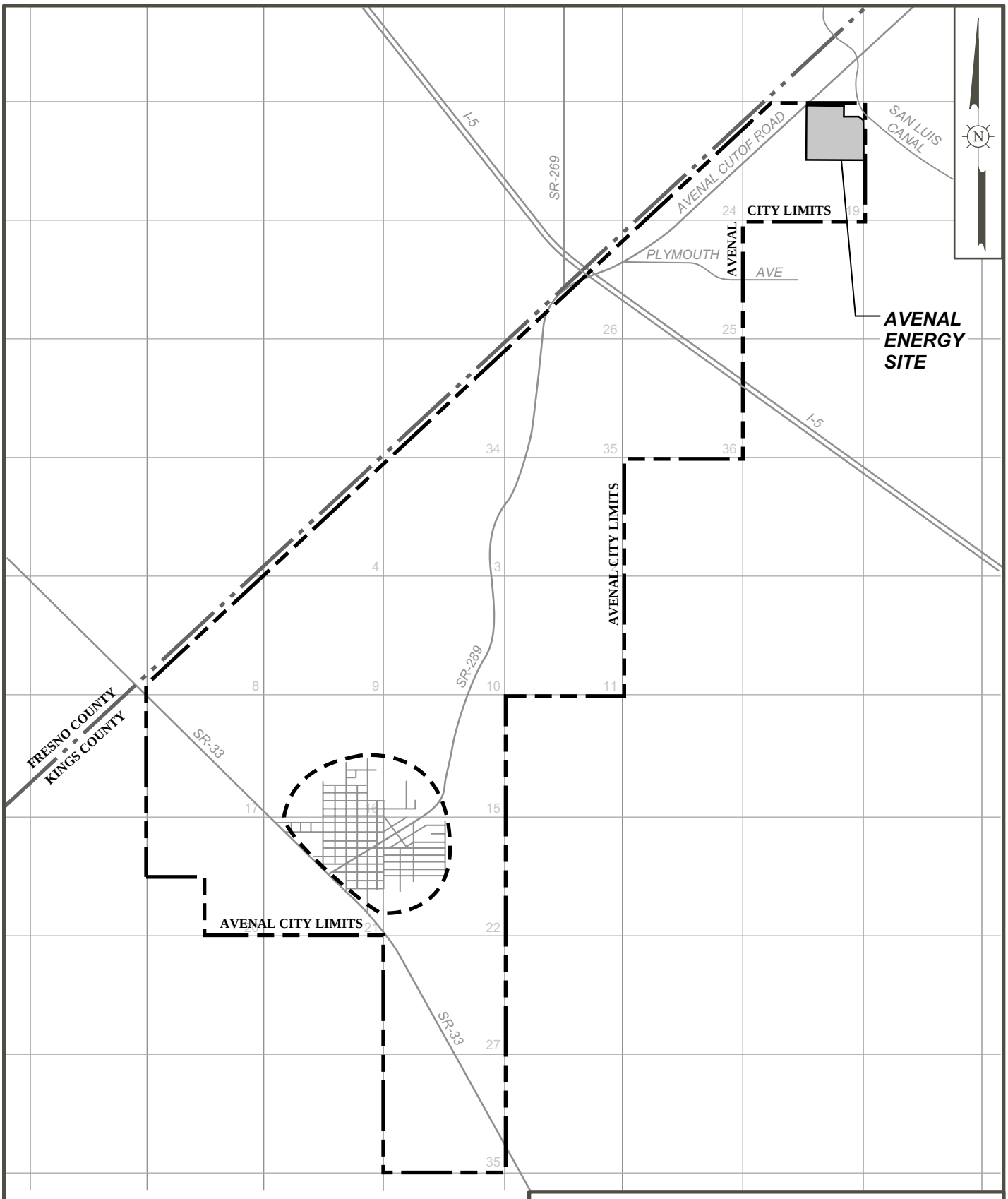
The Project will use advanced combustion turbine technology to minimize emissions of pollutants and, therefore, to minimize potential effects on public health. Potential health risks were comprehensively assessed and determined to be below their significance thresholds.

Because future public health risks will be below significance criteria, no residential or sensitive receptors will be impacted. Sensitive receptors are groups of individuals, including infants, children, the elderly and chronically ill, that may be more susceptible than the general population to health risks from air pollution. Schools, day care facilities, convalescent homes and hospitals are of particular concern. In accordance with Commission guidance (Ringer, 1999), a search was conducted for sensitive receptors within 3 miles of the Project. The search revealed none. Sensitive receptors nearest the Project are located in the main part of the City of Avenal, at a distance of more than 6 miles to the southwest (see Figure 6.16-1). Residential receptors found within approximately 3 miles were located on a map and their coordinates determined (see Table 6.16-1 and Figure 6.16-2). The figure shows no public health impacts because indices of carcinogenic risk and chronic and acute health hazards are below significance thresholds at and beyond the Site boundary (see Section 6.16-4).

Beneficial aspects of the Project regarding protection of public health include the following:

- Clean-burning natural gas as fuel.
- Advanced combustion turbine technology to minimize the amount of fuel needed to produce electricity and to minimize emissions by state-of-the-art emission control technology.

00-311AFC-08 REV.08/24/01



0 6,000 12,000 FEET

SCALE

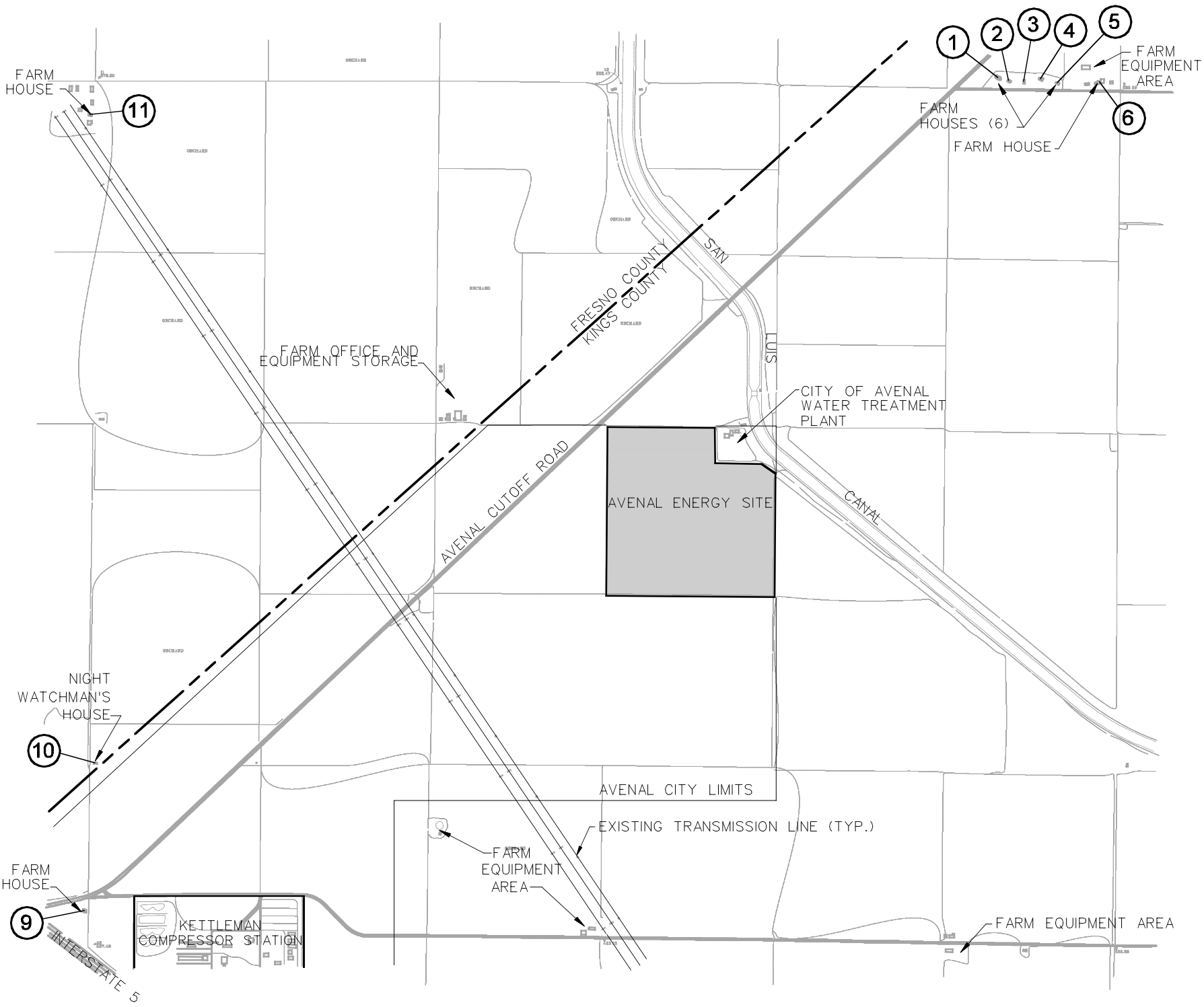
NOTE: MULTIPLE SENSITIVE RECEPTORS ARE LOCATED WITHIN DASHED LINE AROUND THE MAIN PART OF THE CITY OF AVENAL.

REFERENCE: CITY OF AVENAL GENERAL PLAN, EXHIBIT 2.

OFFSITE SENSITIVE RECEPTORS AND PROJECT LOCATION

DUKE ENERGY AVENAL, LLC

AVENAL ENERGY | **FIGURE 6.16-1**



0 2,000 4,000 FEET

SCALE
1:24,000

LEGEND

(1) RESIDENTIAL RECEPTOR LISTED IN TABLE 6.16-1.

OFFSITE RESIDENTAL RECEPTORS

DUKE ENERGY AVENAL, LLC

AVENAL ENERGY | **FIGURE 6.16-2**

TABLE 6.16-1

OFFSITE RESIDENTIAL AND SENSITIVE RECEPTORS AND THEIR COORDINATES

NO.	RECEPTOR/TYPE	UTM (E)[1] (Meters)	UTM (N)[2] (Meters)	DISTANCE FROM CTG STACKS (feet)[3]	REFERENCE FIGURE
1	Residence	765,878	4,000,111	7,700	6.16-2
2	Residence	765,932	4,000,097	7,800	
3	Residence	766,003	4,000,098	7,900	
4	Residence	766,082	4,000,112	8,100	
5	Residence	766,161	4,000,097	8,200	
6	Residence	766,342	4,000,128	8,600	
9	Residence	761,603	3,999,759	11,900	
10	Residence	761,749	3,996,700	10,800	
11	Residence	761,603	3,999,759	11,800	
12	Sensitive	--	--	>6 miles	6.16-1

31161/Rpts/AvenalEnergyAFC(10/3/01/rm)

(1) UTM (E) = Universal Transverse Mercator, east in NAD 83.

(2) UTM (N) = Universal Transverse Mercator, north in NAD 83.

(3) Distance between center of receptor property and a point centered between the two stacks of the combined-cycle combustion gas turbines, rounded to the nearest 100 feet.

- Selective catalytic reduction (SCR) to minimize emissions of nitrogen oxides (NO_x).
- Optimized stack height to reduce ground-level concentrations of exhaust pollutants below public health-related significance thresholds.

This section presents the methodology and results of a human health risk assessment performed to evaluate potential impacts associated with airborne emissions from construction and operation of the Project. Potential public health risks associated with the hypothetical accidental release of aqueous ammonia onsite or during offsite transport are discussed in Section 6.15 - Hazardous Materials Handling. Public health aspects of potential exposure to transmission line electric and magnetic fields are discussed in Section 6.18 - Transmission Systems Safety and Nuisance. Potential safety and health impacts relative to Project employees are discussed in Section 6.17 - Worker Safety.

Project emissions to the air will consist of combustion by-products from the natural gas-fired CTGs and duct burners in the HRSGs. Other sources of pollutants are tests of the diesel-fueled emergency generator and fire pump, plus the evaporation of volatile compounds from maintenance activities. After dispersion to ground-level, inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including ingestion of soil, food and water, and dermal contact, also are evaluated for potential exposure. As discussed below, these health risks are not significant.

This public health section is organized to first discuss the different kinds of air pollutants and health risks, and the methodology used in health risk assessment. The existing conditions of air emissions and potential health risks are then presented, followed by the assessment of potential health risks from the Project.

6.16.1 HEALTH RISK ASSESSMENT

The pollutants for which ambient air quality standards have been set by either the federal government (i.e., U.S. EPA) or the state of California ARB are defined as criteria pollutants. These pollutants, which are discussed in detail in Section 6.2, include the following:

- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Carbon monoxide (CO)
- Particulate matter with aerodynamic diameter less than or equal to 10 micrometers (PM_{10})
- Particulate matter with aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$)

- Ozone (O_3)
- Sulfates (SO_4)
- Lead (Pb)
- Hydrogen sulfide (H_2S)

Precursor emissions for ozone include NO_x and reactive organic gases (ROG). This latter category, ROG, includes noncriteria pollutants (e.g., acetaldehyde, benzene) that can potentially cause health effects. The PM_{10} and $PM_{2.5}$ categories also can include noncriteria pollutants (e.g., arsenic, copper, selenium,) that have the potential to cause health effects.

Potential health effects are of different kinds, both carcinogenic and noncarcinogenic, and hence are analyzed differently and discussed separately.

6.16.1.1 Health Risks

6.16.1.1.1 Carcinogenic Risk

Carcinogenic risk is the estimated chance of contracting cancer over a human life span, assumed to be 70 years, due to environmental exposure to specific substances. Carcinogens are assumed to have no threshold below which there is no human health impact. Any exposure to a carcinogen is assumed to have some chance of causing cancer; the lower the exposure, the lower the risk (i.e., a linear, no-threshold model). The Commission considers an incremental carcinogenic risk from a project of less than 1-in-1-million at a sensitive receptor to be an insignificant impact on public health (Ringer, 1999). In contrast, the SJVUAPCD (2001) applies a threshold of 10-in-1-million if the Project uses BACT for toxics (Toxics - BACT). The same higher threshold of 10-in-1-million risk is used in the Air Toxics "Hot Spots" program (AB 2588) and in California's Proposition 65 as the threshold for further action (e.g., public notification).

The total risk of cancer from all causes in the United States today is about 250,000-in-1-million (or 25 percent). For perspective, total carcinogenic risk from air pollution is about 1,400-in-1-million on average in the South Coast Air Basin (i.e., Los Angeles area), mostly caused by diesel exhaust (SCAQMD, 2000). Environmental and occupational exposures comprise only a small portion of involuntary risks. However, these exposures are a principal focus of regulatory policy because they can be reduced by regulatory initiatives.

6.16.1.1.2 Noncarcinogenic Risk

Noncarcinogenic health effects can be either chronic or acute. Adverse health effects from prolonged exposure to noncriteria pollutants that can accumulate in the body are termed chronic. Because accumulation typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. In determining potential noncarcinogenic health risks from noncriteria pollutants, it is assumed there is a concentration of each pollutant, the REL, below which there would be no impact on human health. The lowest no-effect chronic exposure level for a noncarcinogenic noncriteria pollutant is the REL. Below that threshold, the body is capable of eliminating the pollutant rapidly enough to prevent its accumulation.

The chronic health hazard index for a noncriteria pollutant is defined as the long-term (annual) average concentration of the noncriteria pollutant divided by the chronic REL for that pollutant. Health hazard indices for chronic noncriteria pollutants that affect the same organ or system (e.g., respiratory system) are added to obtain the overall chronic health hazard index for that organ or system. Chronic health hazard indices for different organs were summed to overestimate this risk. The chronic RELs used in the hazard index calculations were those published by the State of California (ARB, 2001a). The significance threshold for chronic health hazard index is 1.0 (SJVUAPCD, 2001) for a project that will apply Toxics - BACT to facility sources of toxics.

Adverse health effects caused by a brief exposure to a noncriteria pollutant of no more than 24 hours are termed acute. The air concentration required for a noncriteria pollutant to cause an acute effect is higher than the concentration required to cause a chronic effect due to the difference in duration of exposure. The acute health hazard index for each pollutant is defined as the short-term (e.g., 1-hour) concentration of the noncriteria pollutant divided by its acute REL. Because acute effects are predominantly manifested in one organ/system (i.e., respiratory system), acute health hazard indices for individual pollutants are summed to calculate one overall acute health hazard index. The significance threshold for acute health hazard index is 1.0 for a project that will apply Toxics - BACT (SJVUAPCD, 2001). Acute RELs are updated regularly by the OEHHA, with the most recent values published in ARB (2001a).

6.16.1.2 Health Risk Assessment Methodology

The methodology used to assess potential human health risks follows generally accepted practice as described by the California Air Pollution Control Officers Association (CAPCOA, 1993). The health risk assessment was conducted in three steps. First, emissions of noncriteria pollutants from proposed sources were estimated. Second, dispersion modeling was used to compute the ground-level concentration of each noncriteria pollutant at defined boundary receptors and offsite grid and discrete receptors. Third, carcinogenic unit risk factors and chronic and acute RELs were used along with the estimated concentrations to compute carcinogenic risk, plus chronic and acute noncarcinogenic health hazard indices.

6.16.1.3 Emission Calculation Methodology

Emissions of noncriteria pollutants from the new CTGs were calculated using emission factors from the California Air Toxics Emission Factor II (CATEF II) Database (ARB, 2001b). The volume of natural gas that will be combusted in the combined-cycle unit, and the resulting emissions of criteria pollutants, are discussed in Section 6.2 - Air Quality.

Maximum 1-hour and annual emissions from the emissions sources are calculated for the scenario described in Section 6.2 - Air Quality. Project turbine emission factors (in units of pounds per million standard cubic feet of natural gas [lbs/MMscf]) were multiplied by the maximum amount of gas combusted per hour to obtain maximum hourly emission rates in units of pounds per hour (lb/hr). The worst-case annual operating scenario for the emission of noncriteria pollutants from the turbines assumed a maximum of up to 8,000 full-load hours per turbine, which includes up to 4,000 hours of duct-fired operation, plus up to 400 start-up hours. Maximum annual emission rates equal the same emission factors multiplied by the maximum amount of natural gas burned in one year.

6.16.1.4 Dispersion Modeling Methodology

Noncriteria pollutant emission rates, calculated as described above, were combined with other input information (e.g., stack height, exhaust temperature) to run a dispersion model. The EPA-approved Industrial Source Complex Short Term Version 3 (ISCST3, issued January 10, 2000) dispersion model was used to compute ground-level concentrations at boundary receptors, gridded receptors surrounding the power plant within 10 miles and residential receptors within approximately 3 miles. The hourly meteorological data used in the model are the same as used in the air quality analysis (see Section 6.2.5).

To identify the locations of maximum impact, several sets of receptors were used, as described in Section 6.2.5.1. Sensitive receptors do not need to be mapped because the health risks described herein are not significant and, therefore, do not define an "…area exposed to the substances…" Further, no sensitive receptors exist within 6 miles of the Project.

The dispersion model computed the maximum hourly and annual average concentrations of each noncriteria pollutant at each receptor. Electronic input and output files for the ISCST3 modeling runs are provided under separate cover to the Commission and SJVUAPCD.

6.16.1.5 Calculation of Health Effects

The dispersion modeling described above computed concentrations of noncriteria pollutants at offsite receptors. It was assumed that a person located at each receptor would be exposed continuously to the computed concentration 24 hours every day for 70 years. In reality, a person would be at a workplace receptor for much less time, such as 8 hours a day, 5 days a week for 46 years. For such individuals, the calculated potential health risk is overstated more than six times.

The results of the dispersion modeling analysis were used with the ARB Health Risk Assessment (HRA) model to determine risks. The model computes carcinogenic risk by multiplying the modeled maximum annual concentration of each noncriteria pollutant by its unit risk factor and summing the resultant risks from all noncriteria pollutants. Chronic health hazard indices were computed by dividing the maximum annual concentrations by the chronic RELs. Similarly, acute health-based indices were computed by dividing the maximum 1-hour concentrations by the acute RELS.

The use of EPA-approved dispersion modeling and CAPCOA health risk assessment methodology provides an upper-bound estimate of potential risks. Actual risks are expected to be substantially lower because of the following aspects of the health risk assessment methodology:

- The maximum ground-level concentration computed at a receptor is assumed to remain for 24 hours each day for 70 years.
- The carcinogenic unit risk factors are determined by the toxicological research community from the lowest concentrations at which effects are observed in exposure studies. These lowest concentrations are then divided by a safety factor between 10 and 1,000 to protect human health with an adequate margin for error.

6.16.1.6 Significance Criteria

Public health-related significance criteria were determined based on CEQA Guidelines, Appendix G, Environmental Checklist Form (approved December 1, 1999) and on performance standards and thresholds adopted by responsible agencies. An impact at the nearest receptor may be considered significant if the Project results in a facility-wide:

- Carcinogenic risk of 10^{-5} at any point on the boundary or offsite (with application of Toxics-BACT) (SJVUAPCD, 2001).
- Carcinogenic risk at a sensitive receptor of 10^{-6} (Ringer, 1999).
- Chronic health hazard index of 1.0 (with application of Toxics-BACT), CAPCOA, 1993; SJVUAPCD, 2001).
- Acute health hazard index of 1.0 (with application of Toxics-BACT), (CAPCOA, 1993; SJVUAPCD, 2001).

6.16.2 EXISTING CONDITIONS

The Site is located approximately 6 miles northeast of the business residential districts of the City of Avenal, in Kings County, California. The City's water treatment plant is located on the northeast corner of the Project Site, and the PG&E Kettleman compressor station is located 2 miles to the southwest. The surrounding area is agriculture.

6.16.3 IMPACTS

Potential health impacts from construction and operation of the new CTGs are discussed separately because the emissions are different in type, magnitude and location.

6.16.3.1 Construction Impacts

Project construction onsite is expected to take approximately 20 months. No significant public health effects are expected because construction practices would comply with the LORS discussed in Section 6.2. Worker safety during construction is assured by strict adherence to the safety practices discussed in Section 6.17.

Temporary emissions from construction and dispersion modeling of PM_{10}, CO and NO_x emissions were performed as described in Section 6.2.5 and Appendix 6.2-4. Because these

emissions are temporary and localized, they will not result in long-term carcinogenic or chronic noncarcinogenic impacts to the public. Maximum concentrations are expected to occur at locations along the immediate Site boundary.

Hazardous waste will be generated during the Project. Section 6.14 - Waste Management describes how hazardous and nonhazardous wastes will be managed to prevent significant impacts on public health or the environment.

6.16.3.2 Operations Impacts

The Project has design features that will keep potential public health impacts below significance thresholds. The use of advanced combustion turbine technology will burn the least amount of natural gas needed to generate 600 MW of electric power.

Potential hazards were identified by evaluating the trace amounts of noncriteria pollutants that will be emitted to the air. The new natural gas-fired combined-cycle unit, equipped with SCR, will be the primary source of potential emissions of noncriteria pollutants not already accounted for in Section 6.16.2. Noncriteria pollutants emitted from combustion of natural gas and diesel fuel, and those volatilizing from other facility sources, are listed in Table 6.16-2. The ammonia listed in Table 6.16-2 is the continuous small amount of "slip" from the SCR control of NO_x emissions; it is not related to storage of aqueous ammonia. Aqueous ammonia and other hazardous materials used and stored onsite are discussed in Section 6.15 - Hazardous Materials Handling. These materials do not emit noncriteria pollutants during normal use and storage. An emission could occur only from an accidental release, with potential offsite consequences as discussed in Section 6.15 - Hazardous Materials Handling. Emission factors for each noncriteria pollutant are listed in Table 6.16-3, along with the maximum hourly and annual emission rates for each noncriteria pollutant from the two combustion turbines.

Emissions and potential public health effects of criteria pollutants are discussed in Section 6.16.4.3. The maximum emission rates are used in the ISCST3 air dispersion model, along with the stack

TABLE 6.16-2

NONCRITERIA POLLUTANTS

POLLUTANT	SOURCES	
	Diesel Exhaust	Natural Gas-Fired Turbine Exhaust(1)
Acetaldehyde		√
Acrolein		√
Ammonia		(2)
Benzene		√
1,3-Butadiene		√
Diesel Exhaust Particulate	√	
Ethylbenzene		√
Formaldehyde		√
Naphthalene		√
PAHs		√
Propylene		√
Propylene Oxide		√
Toluene		√
Xylene		√

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(1) ARB (2001b).

(2) Ammonia slip from selective catalytic reduction systems to be installed to control NO_X emissions as part of the Project.

TABLE 6.16-3(1)

NONCRITERIA POLLUTANTS EMISSION FACTORS AND RATES

POLLUTANT	EMISSION FACTORS	EMISSION RATE	
	($lb/10^6$ scf)	Maximum Hourly (lb/hr, each)	Annual (ton/yr total, 2 turbines)
Combustion Turbines (with Duct Burners)			
Ammonia	(2)	30.1	227.4
Propylene	7.71×10^{-1}	1.65	12.6
HAPs (3)			
Acetaldehyde	4.08×10^{-2}	0.09	0.67
Acrolein	3.69×10^{-3}	0.01	0.06
Benzene	3.33×10^{-3}	0.01	0.05
1,3-Butadiene	4.39×10^{-4}	9.4×10^{-4}	7.2×10^{-3}
Ethylbenzene	3.26×10^{-2}	0.07	0.53
Formaldehyde	1.65×10^{-1}	0.35	2.7
Hexane	2.59×10^{-1}	0.55	4.24
Naphthalene	1.33×10^{-3}	2.8×10^{-3}	2.2×10^{-2}
Polycyclic Aromatic Hydrocarbon	--See Table 6.2-1.9a For Individual PAHs--		
Propylene Oxide	2.69×10^{-2}	0.06	0.48
Toluene	1.33×10^{-1}	0.28	2.2
Xylene	6.53×10^{-2}	0.14	1.1
Total HAPs (two turbines)			**12.0**
Auxiliary Boiler			
Propylene	0.53	0.018	0.023
HAPs			
Acetaldehyde	8.9×10^{-3}	<0.01	<0.01
Acrolein	2.70×10^{-3}	<0.01	<0.01
Benzene	4.31×10^{-3}	<0.01	<0.01
Ethylbenzene	6.90×10^{-2}	<0.01	<0.01
Formaldehyde	0.221	<0.01	<0.01
Hexane	4.6×10^{-3}	<0.01	<0.01
Naphthalene	3.0×10^{-4}	<0.01	<0.01
Polycyclic Aromatic Hydrocarbon	1.0×10^{-4}	<0.01	<0.01
Toluene	2.7×10^{-2}	<0.01	<0.01
Xylene	2.0×10^{-2}	<0.01	<0.01
Total HAPs			**0.015**

TABLE 6.16-3(1)

NONCRITERIA POLLUTANTS EMISSION FACTORS AND RATES
(Continued)

POLLUTANT	EMISSION FACTORS	EMISSION RATE	
	(ppm)	Maximum Hourly (lb/hr, each)	Annual (ton/yr total, 2 turbines)
Plant Cooling Tower			
Ammonia	6.85	<0.01	<0.01
Copper	0.5	<0.01	<0.01
Silver	0	<0.01	<0.01
Zinc	1	<0.01	<0.01
HAPs			
Aluminum	1.5	<0.01	<0.01
Arsenic	1.0	<0.01	<0.01
Cadmium	0.05	<0.01	<0.01
Chromium III	0.15	<0.01	<0.01
Lead	0	<0.01	<0.01
Mercury	0	<0.01	<0.01
Nickel	0	<0.01	<0.01
Total HAPs			<0.01
Inlet Air Chillers' Auxiliary Cooling Towers			
Ammonia	6.85	<0.01	<0.01
Copper	0.5	<0.01	<0.01
Silver	1	<0.01	<0.01
Zinc	0.056	<0.01	<0.01
HAPs			
Aluminum	1.5	<0.01	<0.01
Arsenic	1	<0.01	<0.01
Cadmium	0.05	<0.01	<0.01
Chromium III	0.15	<0.01	<0.01
Lead	0	<0.01	<0.01
Mercury	0	<0.01	<0.01
Nickel	0	<0.01	<0.01
Total HAPs			<0.01
Emergency Diesel Generator			
Diesel Exhaust Particulate	0.340 g/bhp-hr	0.59	--
Diesel-Engine Fire Pump			
Diesel Exhaust Particulate	0.12 g/bhp-hr	0.10	--

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(1) Taken from Table 6.2-22.
(2) Ammonia emissions calculated from 10 ppm ammonia slip rate. See Appendix 6.2-1, Table 6.2-1.1.
(3) Hazardous air pollutants.

TABLE 6.16-4

PROJECT EMISSION SOURCES

FUEL	SOURCE NAME		LOCATION		STACK	
			UTM(E)[1] (Meters)	UTM(N)[2] (Meters)	Height (Meters)	Diameter (Meters)
Natural gas	CTGs	Stack 1	764,615.5	3,997,742.3	44.2	5.486
		Stack 2	764,645.8	3,997,772.5	44.2	5.486
		Auxiliary Boiler	764,692.9	3,997,807.4	11.3	0.81
Diesel	Diesel Engine Fire Pump		764,890.3	3,997,747.9	3.05	0.15
	Emergency Diesel Generator		764,669.0	3,997,789.9	3.05	0.20
Not Applicable	Plant Cooling Tower (7 cells)		764,845.9 to 764,916.2	3,997,591.8 to 3,997,662.1	13.7	9.6
	Chiller 1 Auxiliary Cooling Tower (4 cells)		764,662.9 to 764,670.7	3,997,636.5 to 3,997,644.3	16.1	3.6
	Chiller 2 Auxiliary Cooling Tower (4 cells)		764,651.5 to 764,659.2	3,997,648.0 to 3,997,655.7	16.1	3.6
	Chiller 3 Auxiliary Cooling Tower (4 cells)		764,640.0 to 764,647.8	3,997,659.4 to 3,997,667.2	16.1	3.6

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[1] UTM(E) = Universal Transverse Mercator, east in NAD 27.
[2] UTM(N) = Universal Transverse Mercator, north in NAD 27.

parameters listed in Table 6.16-4, to compute maximum hourly and annual ground-level ambient concentrations shown in Table 6.16-5.

The ground-level ambient concentrations produced by the Project (Table 6.16-5) are combined with the carcinogenic unit risk factors and noncarcinogenic RELs in Table 6.16-6 to calculate potential health risks.

6.16.4 RESULTS

The results are presented separately for the potential carcinogenic (Section 6.16.4.1) and noncarcinogenic (Section 6.16.4.2) impacts of emitted noncriteria pollutants. The potential health effects of criteria pollutant emissions are discussed relative to ambient air quality standards in Section 6.16.4.3.

6.16.4.1 Estimated Carcinogenic Risks

Table 6.16-7 presents the maximum offsite carcinogenic risk from the Project. As shown, the maximum carcinogenic risk at any receptor is 0.08 in one million from the gas turbine exhaust, and 0.15 in one million at the nearest residence from the 100 hours per year testing of the diesel-fueled fire pump and 200 hours per year testing of the diesel-fueled emergency generator. Carcinogenic risk to sensitive receptors is less than one-in-one million. These risks are considerably lower than significance thresholds. The location of the insignificant maximum cancer risk is shown in Section 6.2 - Air Quality.

6.16.4.2 Estimated Noncarcinogenic Risks

Table 6.16-7 presents the calculated maximum chronic hazard index of 0.01. This index is only one percent of the significance criterion of 1.0. Table 6.16-7 presents the calculated maximum acute hazard index of 0.06. This index is only 6 percent of the significance criterion of 1.0.

Because the chronic and acute health hazard indices are well below their significance criteria of 1.0, the Project will have no significant noncarcinogenic health effects.

TABLE 6.16-5

MAXIMUM FUTURE OFFSITE GROUND-LEVEL CONCENTRATIONS OF NONCRITERIA POLLUTANTS

NONCRITERIA POLLUTANTS	MAXIMUM OFFSITE GROUND-LEVEL CONCENTRATIONS ($\mu g/m^3$)	
	1-Hour	Annual
Acetaldehyde	9.7×10^{-2}	7.1×10^{-4}
Acrolein	8.8×10^{-3}	6.4×10^{-5}
Ammonia	33.1	2.4×10^{-1}
Arsenic	4.4×10^{-4}	7.1×10^{-6}
Benzene	8.0×10^{-3}	5.9×10^{-5}
Benzo(a)anthracene	5.3×10^{-5}	3.9×10^{-7}
Benzo(a)pyrene	1.5×10^{-4}	2.9×10^{-7}
Benzo(b)fluoranthrene	2.7×10^{-5}	1.9×10^{-7}
Benzo(k) fluoranthrene	2.6×10^{-5}	1.9×10^{-7}
1,3-Butadiene	1.0×10^{-3}	7.4×10^{-6}
Cadmium	2.2×10^{-5}	3.6×10^{-7}
Chrysene	5.9×10^{-5}	4.3×10^{-7}
Copper	2.2×10^{-4}	3.6×10^{-6}
Dibenz(a,h)anthracene	5.5×10^{-5}	4.0×10^{-7}
Diesel Exhaust Particulate (1)	0.14	4.9×10^{-4}
Ethylbenzene	1.1×10^{-1}	5.8×10^{-4}
Formaldehyde	4.0×10^{-1}	2.9×10^{-3}
Hexane	0.61	4.5×10^{-3}
Indeno(1,2,3-cd)pyrene	5.5×10^{-5}	4.0×10^{-7}
Naphthalene	3.1×10^{-3}	2.3×10^{-5}
Propylene	1.83	1.3×10^{-2}
Propylene oxide	7.0×10^{-2}	5.1×10^{-4}
Toluene	3.1×10^{-1}	2.3×10^{-3}
Xylene	1.5×10^{-1}	1.1×10^{-3}
Zinc	4.2×10^{-4}	6.6×10^{-6}

31161/Rpts/AvenalEnergyAFC (8/24/01/rm)

(1) At nearest residence.

TABLE 6.16-6

CARCINOGENIC UNIT RISK FACTORS AND REFERENCE EXPOSURE LEVELS FOR NONCRITERIA POLLUTANTS(1)

NONCRITERIA POLLUTANT	CARCINOGENIC UNIT RISK FACTOR $(\mu g/m^3)^{-1}$	REFERENCE EXPOSURE LEVEL (REL) $(\mu g/m^3)$	
		Chronic	Acute
Acetaldehyde	2.7E-06	9	--
Acrolein	--	0.06	0.19
Ammonia	--	200	3,200
Arsenic	3.3E-03	3.0E-02	0.19
Benzene	2.9E-05	60	1,300
Benzo(a)anthracene	1.1E-04	--	--
Benzo(a)pyrene	1.1E-03	--	--
Benzo(b)fluoranthrene	1.1E-04	--	--
Benzo(k)fluoranthrene	1.1E-04	--	--
1,3-Butadiene	1.7E-04	20	--
Cadmium	4.2E-03	2.0E-02	--
Chrysene	1.1E-05	--	--
Copper	--	2.4	100
Dibenz(a,h)anthracene	1.2E-03	--	--
Diesel Exhaust Particulate	3E-04	5	--
Ethylbenzene	--	2,000	--
Formaldehyde	6.0E-06	3.0	94
Hexane	--	7,000	--
Ideno(1,2,3-cd)pyrene	1.1E-04	--	--
Naphthalene	--	9	--
Propylene	--	3,000	--
Propylene oxide	3.7E-06	30	3,100
Sulfates	--	25	120
Toluene	--	300	37,000
Xylene	--	700	22,000
Zinc	--	35	--

31161/Reports/AvenalEnergyAFC (8/24/01/rw)

-- = None available.
(1) ARB (2001a).

TABLE 6.16-7

MAXIMUM POTENTIAL HEALTH RISKS

SOURCE	MAXIMUM CARCINOGENIC RISK	MAXIMUM NONCARCINOGENIC RISK	
		Chronic Hazard Index	Acute Hazard Index
Project	0.08×10^{-6}(1)	0.01	0.06
	0.15×10^{-6}(2)		
Significance Threshold	10×10^{-6} (CAPCOA, 1993; SJVUAPCD, 2001)	1.0	1.0
	1×10^{-6} (Sensitive Receptor)		
Significance Level	Insignificant	Insignificant	Insignificant

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(1) Excluding testing of diesel-fueled emergency equipment.
(2) Diesel-fueled emergency equipment only at the nearest residence.

6.16.4.3 Criteria Pollutants

Emissions of four criteria pollutants from routine Project operations were modeled and evaluated for their impacts on air quality in Section 6.2. Maximum predicted concentrations from the Project were compared to the federal and state Ambient Air Quality Standards, which are concentration limits that protect public health of the most sensitive individuals, with a margin of safety, and also serve as inhalation RELs. With the exception of PM_{10} standards which are already being exceeded in Kings County, modeling of NO_2, CO and SO_2, indicate that these health-protective standards will not be exceeded. Therefore, potential health effects from emission of criteria pollutants will be below thresholds of significance.

6.16.4.4 Public Health Risks - Hazardous Materials Stored and Used Onsite

Section 6.15 - Hazardous Materials Handling presents an assessment of potential offsite consequences in the unlikely event of an accidental release of aqueous ammonia, the only substance used or stored onsite in quantities sufficient to require offsite consequence analysis. Design features have been incorporated into the Project to keep potential offsite public health impacts of a hypothetical worst-case release below thresholds of significance.

6.16.4.5 Proposition 65 Noncriteria Pollutants

Potential emissions include substances listed as Proposition 65 constituents under the California Safe Drinking Water and Toxic Enforcement Act of 1986. These substances include carbon monoxide, benzene, formaldehyde and used engine oil. The health risk assessment, applied to the noncriteria pollutants benzene and formaldehyde, indicates that the potential carcinogenic risks of these Proposition 65 substances are less than significant. The air quality impact analysis in Section 6.2 shows that the ambient concentration of carbon monoxide will be less than the most stringent ambient air quality standard and, hence, protective of public health (i.e., a less than significant impact).

Duke Avenal will develop and post Proposition 65 warning signs at various locations on the Site to assure that visitors and employees know that such substances are present. Further, Duke Avenal will place a Proposition 65 notice in the local newspapers on a quarterly basis to inform the community that the Project will emit these substances.

6.16.4.6 Summary of Impacts

The health risk assessment indicates that emissions of noncriteria pollutants arising from Project construction and operation will not cause significant public health impacts. Results from criteria pollutant modeling for the Project indicate that, with the exception of PM_{10} standards, which are already being exceeded in Kings County, potential concentrations of NO_2, CO and SO_2 from the Project will be below ambient air quality standards established to protect public health, including sensitive segments of the population. Hence, emissions of criteria pollutants from the Project are not expected to cause significant public health impacts.

6.16.4.7 Cumulative Impacts

Offsite sources that already exist, or are planned for the future, were considered for potential cumulative impacts (Table 6.1-1). To assure that potential cumulative impacts of the Project and other nearby projects are adequately considered, a cumulative impact analysis was conducted (see Appendix 6.2-7). The cumulative impact analysis concluded that no other project within 6 miles would contribute impacts beyond those reported herein because of the following:

- Existing sources of air pollutants are included in the use of maximum background concentration.
- The one source newer than the period of reported background concentration measurements only emits less than one ton per year of all pollutants.

6.16.5 MITIGATION MEASURES

Based on the design and operational features that have been incorporated into the Project, and the results of the health risk assessment, no mitigation measures are required.

6.16.6 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACT

No significant unavoidable adverse impacts on public health will occur from the Project.

6.16.7 LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

An extensive discussion of air quality LORS is presented in Section 6.2.4.1. Because air quality LORS were promulgated to protect public health, compliance with those LORS assures that the

Project will cause no significant impacts on public health. The Project will be in compliance with applicable LORS during construction and operation because of the following:

- The Project complies with all applicable SJVUAPCD and federal rules and regulations that limit emissions.
- Air quality analysis, including dispersion modeling, shows that ground-level concentrations of criteria pollutants are below ambient air quality standards.
- The health risk assessment of noncriteria pollutants has been conducted and shows that potential public health impacts are insignificant.

Permits required for the Project relative to both air quality and public health, and the issuing agencies, are discussed in Section 6.2.

6.16.8 REFERENCES

Air Resources Board (ARB). Consolidated Table of OEHHA/ARB-approved Risk Assessment Health Values. <http://www.arb.ca.gov/topics/healthval/contable.pdf>. Last updated July 21, 2001a.

ARB. The California Air Toxics Emission Factor (CATEF II) Database <http://www.arb.ca.gov/emisinv/catef/catef.htm>. Updated March 5, 2001b.

California Air Pollution Control Officers Association (CAPCOA). *Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines*. October 1993.

Ringer, M. Personal communication from M. Ringer, California Energy Commission, to Eric Walther, TRC. January 29, 1999.

South Coast Air Quality Management District (SCAQMD). 2000 Air Toxics Control Plan. <http://www.aqmd.gov/aqmp/atcp_ch_ii.html>. August 23, 2000.

San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD). *Risk Management Policy for Permitting New and Modified Sources.* March 2, 2001.